

## Processing of ACD gives no evidence for QR

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**Abstract** Hackl, Koster-Hale and Varvoutis (2012) argue for the existence of QR on the basis of the processing of ACD. But they failed to include a crucial control. Once included, one can show that the effect they demonstrate comes not from QR but comes instead from a pressure to insert word like *also* or *same* where the reported events are 'the same'. We further show that the asymmetry between *every* and *the* is due to the fact that use of *every* in the relevant cases makes it easier to establish a causal connection between the events, removing the pressure to insert *also* or *same*. Finally we show that - for their 'Large Ellipsis' condition in their Experiment 2 - their hypothesis does not account for their reported data (at least not without additional assumptions), but ours does.

**Keywords:** Quantifier raising, ACD, transitive verb phrase ellipsis

### 1 Background: Two views on Antecedent Contained Deletion (ACD)

Consider two accounts of Antecedent Contained Deletion (Bouton, 1970):

- (1) Sarah will read every newspaper that Katie will.

The first is what we will call the quantifier raising (QR) analysis, discussed by Sag (1976) and many since. This is motivated by two assumptions as follows. (i) The semantic combinatorics are such that a VP meaning must be understood at the 'ellipsis site'. For example, this would follow if  $[[\text{will}]]$  requires an  $\langle e, t \rangle$  (or,  $\langle i, \langle e, t \rangle \rangle$ ) complement. (ii) The meaning (or representation) understood at the ellipsis site must also be the meaning/representation of some other overt linguistic expression in the same discourse. But the problem posed by (1) is that here there is no overt VP that can supply the missing meaning/representation. It can't be the surface matrix VP, as that would engender the antecedent containment paradox.

The QR solution posits a level of representation – Logical Form – at which the object DP is not in its surface position but rather in a raised position. This can be accomplished by means of QR; under this analysis the matrix VP has as its LF representation *read t* (with some index on *t*). This can then serve as the VP whose meaning/representation is supplied as the missing material in the ellipsis site. (Note that we are using the term 'supplying' something rather than using the terminology of a theory in which the ellipsis site contains material which is

allowed to be silent. These two different ways of phrasing things is irrelevant to the points at issue here. We pick one for expository convenience.)

But this is not the only way to account for (1). An alternative is the Transitive Verb (Phrase) (TVP) ellipsis analysis, which is often embedded in a Categorical Grammar (see Cormack 1984, Jacobson 1992a, 1992b, 2003, etc.). By way of background, consider a non-ellipsis case like (2):

(2) Sarah will read every newspaper that Katie will read.

A common treatment of a relative clause such as (*that*) *Katie will read* within Categorical Grammar assumes that there is no movement and no trace. Rather, in the semantics [[read]] (of type  $\langle e, \langle e, t \rangle \rangle$ ) can function-compose with [[will]] (of type  $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$ ) which in turn function-composes with type-lifted *Katie* (of type  $\langle \langle e, t \rangle, t \rangle$ ) (e.g., Steedman 1987; Jacobson 2003 and 2014 for a variant of this). Note that we are ignoring intensions. The syntax is treated similarly under the Categorical Grammar treatment of syntactic categories. Hence *will* does not need to combine with a VP meaning but rather can directly combine with a transitive verb (phrase) meaning - a meaning of type  $\langle e, \langle e, t \rangle \rangle$ . The result, then, is that no movement is needed. An ACD case like (1) is similar. All that needs to be supplied is a 'missing' 2-place relation and this function composes with [[will]] here too. And this relation is available, as the meaning of *read* in the first clause. (For a fully explicit account, see Jacobson 2003.) Thus under the TVP Ellipsis hypothesis, no QR is needed in order to account for the well-formedness of examples like (1). This analysis has important consequences. Although the QR account of ACD has literally become a 'textbook' argument for the existence of LF (e.g., Heim and Kratzer 1998), ACD can be analyzed instead as TVP ellipsis. Hence this phenomenon does not demonstrate the need for LF.

## 2 Apparent new evidence for QR

Recently, Hackl, Koster-Hale and Varvoutis 2012 (hereafter, HKV) argue that there is new evidence for QR (and hence, LF) on the basis of on-line reading times and off-line acceptability judgments centering on ACD cases. Here we will consider only the off-line judgments because Gibson, Mahowald, Piantadosi, and Levy (in submission) show that analyses of HKV's own data demonstrate that the critical effects were actually not statistically significant. However, HKV's acceptability judgments were replicated in Gibson, Jacobson, Piantadosi, Mahowald, Fedorenko and Graff 2014 so we focus on those. In the remainder of this paper, we first sketch HKV's argument for QR. We then summarize an alternative explanation for their effects which is detailed in Gibson et al. 2014. While some of the subsequent material overlaps with Gibson et al. 2014, the present paper elaborates in fuller detail on several of those points, provides new

evidence bearing on our explanation for what we will call the HKV effect, and provides new discussion of the consequences of our analysis for the results of HKV's 'Large Ellipsis' conditions in their Experiment 2.

HKV's argument rests on the following assumptions. (i) The comprehension mechanism takes the minimal steps needed to compute a meaning. (ii) [[read]] is of type  $\langle e, \langle e, t \rangle \rangle$ . Hence, if the comprehension mechanism encounters an object of type  $e$  following *read*, no QR is needed. More specifically, when it encounters a DP headed by *the*, it expects a DP of type  $e$  and so does not perform QR. (iii) If, on the other hand, the comprehension mechanism encounters an object of type  $\langle \langle e, t \rangle, t \rangle$  following *read*, then QR is needed. Furthermore, the comprehension mechanism does not need to wait until it has computed the entire object DP; on encountering *every*, it knows it will hit a generalized quantifier and so it performs QR at that point. (Although HKV assume that the type-mismatch in the object position of *read* is resolved by QR, there are other accounts of how a generalized quantifier can serve as the object of *read*. See, e.g., Partee and Rooth (1983) and Hendriks (1993) who posit not QR but rather a type-shift rule operating on the meaning of *read*.) (iv) Reanalysis is costly, which results in slower reading times and degraded acceptability. (v) ACD involves VP ellipsis (i.e., the supplying of a VP meaning), not TVP ellipsis.

Putting these together, it is predicted that (3) should have a higher acceptability rating than (4):

- (3) Sarah read every book that Katie did.
- (4) Sarah read the book that Katie did.

In the case of (3), the comprehension mechanism applies QR as soon as it encounters *every*, in accordance with assumption (iii) above. But since no QR is needed on encountering *the* in (4), by assumption (i) QR will not be applied at that point. Later, however, the comprehension mechanism encounters an ellipsis site, which it tries to resolve (i.e., it tries to find a meaning or a representation to supply at this sight). For the case of (3), the matrix VP is already available to resolve ellipsis (since QR has applied, this VP is *read t*). For the case of (4) there is no obvious VP available (as these sentences were given out of context, so there is no other VP besides the matrix VP that the comprehension mechanism could supply). Hence the comprehension mechanism needs to do something to resolve the ellipsis. It is important to point out that the comprehension mechanism cannot know that QR will allow the ellipsis to be resolved (it is not clairvoyant), and we return to this point later. However, presumably HKV are assuming that the comprehension mechanism simply tries whatever it can in the hopes of supplying an antecedent for the ellipsis site, and one such option is to go back and perform QR. This allows the ellipsis to be resolved. But this involves reanalysis which, by assumption (iv), is costly. And so processing (4) should be more costly than (3),

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leading to a decline in acceptability. And indeed this decline was found both by HKV and in our replication.

### 3 An alternative explanation for the HKV effect: the 'Sameness hypothesis'

In Gibson et al. 2014 we provide evidence that the greater acceptability of (3) (with *every*) over (4) (with *the*) has nothing to do with QR, and we provide an alternative explanation. We summarize the alternative explanation below along with evidence for it, and elaborate on some of the discussion. Our hypothesis – which we refer to as the Sameness hypothesis – is that there is a pressure with *the* – but not with *every* – to highlight the sameness of the events by insertion of *also* or *same*, and that stimuli like (4) are judged as degraded because they do not contain explicit highlighting of the 'sameness'. We return below to the reason why the pressure is absent or diminished with *every*.

First, note that there is independent evidence for this pressure, quite apart from the domain of ellipsis. See, for example, Green 1968, Kaplan 1984 and many since for the observation that sentences like (5a) are degraded compared to (5b), where no *also* or *too* is present:

- (5) a. ?\* Katie read *The New York Times*, and Sarah did/read it.  
b. Katie reads *The New York Times*, and Sarah also did/reads it.

However, it is not always the case that the 'sameness' of events needs to be marked by use of *also* or *too*. If there is an independent connection between the events – such as a causal one – then this pressure disappears. Hence (6) is good:

- (6) Katie read *The New York Times* because Sarah did.

The use of *and then* or *after* also removes the pressure to insert *also* or *too*.

This then leads us to a second hypothesis: perhaps the reason that the pressure is less (or even disappears) with *every* is that it is easier to establish a causal connection with *every*. Let us call this the Causal hypothesis. While this was put forth in Gibson et al. 2014, no quantitative evidence for it was provided there. In Section 5 we present evidence in support of this hypothesis. First, though, we review some evidence for the Sameness hypothesis.

## 4 Evidence for the Sameness hypothesis

### 4.1 No ellipsis with the same verb

One way in which the predictions made by the QR hypothesis and the Sameness

hypothesis differ is that the latter predicts that the advantage for *every* over *the* should persist even when there is no ellipsis, as long as the relative clause contains the same verb. In other words, (7a) should be better than (7b):

- (7) a. Sarah will read every newspaper that Katie will read.  
 b. Sarah will read the newspaper that Katie will read.

The QR hypothesis makes no such prediction. Nothing forces QR in the case of (7b) and so no reanalysis is necessary; it should thus be as acceptable as (7a).

HKV did not test this case; they only compared cases of ellipsis with cases with non-ellipsis including a full but *different* verb. On the face of it, the obvious control is not a comparison with a different verb, but one with the same verb, in order to ensure that the meaning is the same. Let us forestall a possible objection here. HKV discuss their rationale for not testing cases like (7) where the same verb is used, as follows: "To prevent possible interference due to anaphoric down-stressing, which is subject to licensing constraints that are very similar to ellipsis (see Tancredi 1992 among many others), we chose lexical verbs that were different from the matrix verb." (HKV 2012: 166). This is cryptic, so we reconstruct their reasoning as follows. First, the comprehension mechanism might supply deaccented (i.e., "down-stressed") prosody for *read (t)*. (This assumes that – although these stimuli are read – a prosody is silently supplied.) If so, that in itself would force QR in order to license the deaccenting. This is because presumably the comprehension mechanism must find another VP of the form *read t* to match the deaccented *read t* in the relative clause. Hence the same verb condition potentially is just like ACD; *every* would continue to have an advantage over *the* much like in the ACD case. Reanalysis would be needed in order to go back and do QR which is required to license the deaccented prosody which the comprehension mechanism has already supplied.

But careful reflection reveals flaws in this reasoning. First, deaccenting does not have the same conditions as ellipsis (see, e.g., Rooth 1992). But for the moment, let us suppose (as is assumed in the above chain of reasoning) that deaccenting of *read t* in the relative clause does indeed require another VP of the form *read t*. Then the above logic is circular. For in that case the conditions for deaccenting are simply not met when the comprehension mechanism encounters *read (t)*. The comprehension mechanism would have no reason to supply the deaccented prosody, because the meaning can be computed perfectly well without it. We stress again that the comprehension mechanism is not clairvoyant: it does not know that *read (t)* in the relative clause is identical to anything and so it has no reason to deaccent. Note that the fact that a speaker might deaccent the full verb *read* is quite different from what the comprehension mechanism might do. The speaker already knows the meaning, but the comprehension mechanism does not. Hence there would be no reason for that mechanism to supply deaccented

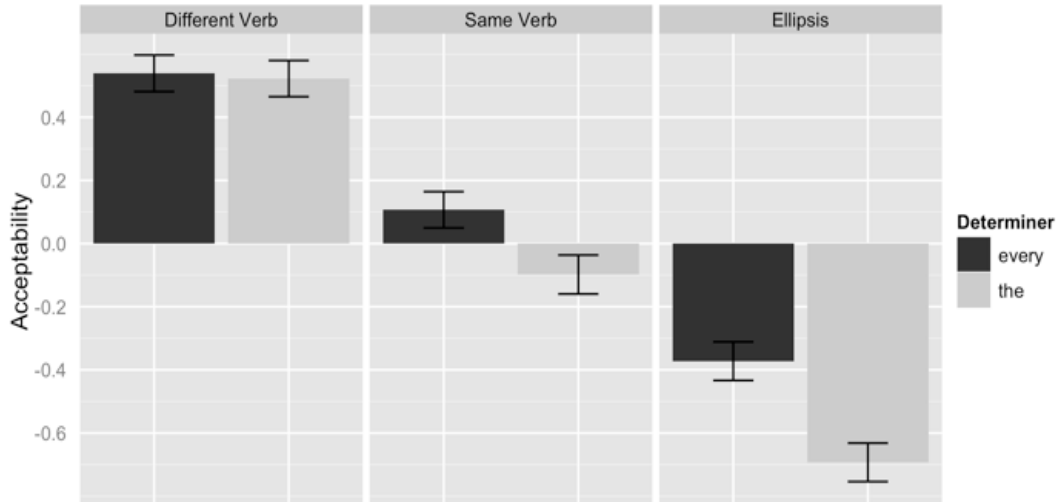
prosody, and it would encounter no difficulty in computing a meaning without deaccenting. And hence the comprehension mechanism also has no need to perform reanalysis in the *the* condition. It is instructive to contrast this to the ellipsis situation under the HKV set of assumptions. In ellipsis, reanalysis is needed because there is simply no way for the comprehension mechanism to arrive at a meaning (under HKV's views) without going back and doing QR. But when the full verb is present there is no problem in computing a meaning. And even after that meaning is computed there is no 'identical VP' (since QR has not been performed) and no reason for the comprehension mechanism to notice or care that it did not deaccent! Thus *every* should have no advantage over *the* under the scenario in which deaccenting requires identical VPs and hence QR.

Suppose, on the other hand, simply supplying the same verb is enough to trigger deaccenting. In other words, on encountering *read* the sentence comprehension mechanism automatically supplies the deaccented prosody in virtue of the fact that there is another instance of *read* in the top-level verb of the sentence. But this then means that the local identity between the two occurrences of *read* is sufficient to license deaccenting – and so no QR is needed to license it. The sentence comprehension mechanism does not need to find a matrix VP whose representation is *read t* and so again no reanalysis is needed. Once again, then, the advantage of *every* over *the* should disappear.

The actual empirical situation with regards to deaccenting is complex. As noted above, identity of LF is not required in general for deaccenting; deaccented material is possible whenever something is 'old information' - whether that is due to having been said, by inference, or even by general knowledge. (See, e.g., Lakoff 1971 and Rooth 1992). But in any case there is no reason for the comprehension mechanism to apply QR in a case like (7). Clearly, then, this is the key control needed for the HKV experiment.

Hence the Sameness hypothesis and the QR hypothesis make different predictions with regards to (7). The former predicts that *every* should have an advantage over *the*, whereas the latter predicts no difference. In order to test these predictions, Experiments 1 and 2 in Gibson et al. 2014 evaluated edited versions of HKV's Experiment 1 and 2 materials respectively, by collecting acceptability judgments over Amazon.com's Mechanical Turk. The results from the two experiments were very similar statistically, so we present only the results from Experiment 1 here. In each of the two experiments, we crossed the determiner (*every*, *the*) with the ellipsis type (ellipsis, different verb, and same verb), using stimuli like (8), corresponding to a shortened version of an item from HKV's Experiment 1:

- (8) The understaffed general hospital was negotiating with...  
every/the doctor that the nonprofit medical organization was/funded/was negotiating with.



**Figure 1** Z-score acceptability rating results from Gibson et al. 2014 Experiment 1, crossing *the/every* with ellipsis, same verb, and different verb, using edited versions of the materials from HKV's Experiment 1. Error bars show 95% confidence intervals.

90 experimental participants were asked to rate the naturalness of these materials on a scale from 1 (Extremely unnatural) to 5 (Extremely natural). Participants also answered a comprehension question about each sentence. We present z-transformed acceptability ratings (means and standard deviations estimated within participants) in Figure 1. As can be seen in the figure, the determiner and ellipsis type interacted for the ellipsis vs. different verb, such that there was a larger difference between the *every* over *the* conditions for the *ellipsis* versions than for the *different verb* conditions, thus replicating HKV's acceptability rating results for corresponding materials. Most importantly to the predictions discussed here, the determiner and ellipsis type also interacted for the same vs. different verbs, such that there was a larger difference between the *every* and *the* conditions for the *same-verb* versions than for the *different-verb* conditions, as predicted by the Sameness hypothesis but not the QR hypothesis.

We should note that the advantage for *every* over *the* is not as robust without ellipsis as with ellipsis, but this is not entirely surprising. It is likely that the case of ellipsis more strongly directs the comprehension mechanism to the 'sameness' of the events than does repetition of the verb. This is consistent with the Causal

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hypothesis documented below. We also note that sentences with both *the* and *every* with the same verb are degraded over those containing a different verb. This difference could well be due to differences in plausibility between the sets of items (which were not normed by HKV to be matched for plausibility). Many of their stimuli are such that it is odd for one person to be "verbing *the/every* noun" that someone else was, as in, for example, one person waving around the/every hammer that another person was.

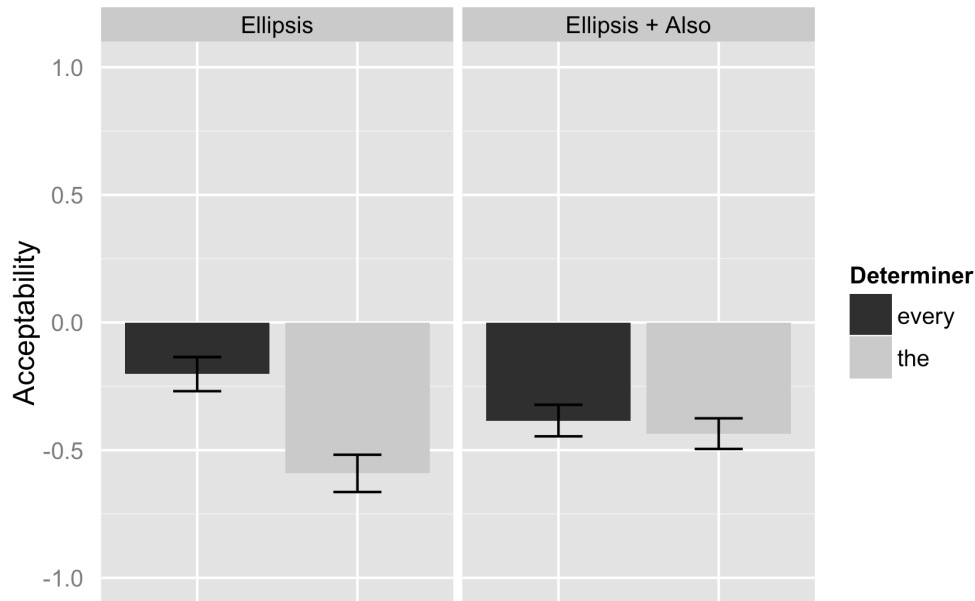
#### 4.2 Ellipsis with insertion of *also*

A second way in which the two hypotheses make different predictions concerns the insertion of words that explicitly link the potential similarity of two clauses, such as *also*. The Sameness hypothesis predicts that the advantage for *every* over *the* should disappear in this case, while the QR hypothesis predicts that the advantage should remain. Once again let us forestall a possible objection. One can imagine a view of the computation of the presupposition of *also* according to which it too would trigger QR in a case like (9):

(9) Sarah read every/the newspaper that Katie also did.

There are interesting complexities regarding the presupposition of *also* here as this too is a case of antecedent containment (the presupposition is satisfied in virtue of what Sarah reads); for detailed discussion of the interaction of antecedent containment with *also*, see Jacobson 2009. Leaving those details aside, one might hypothesize that QR is needed in (9) in virtue of an assumption that the presence of *also* requires the comprehension mechanism to find an S containing a full VP of the form *read (t)* in order to satisfy the presupposition of *also*. If so, this would force QR in the matrix. But this is highly unlikely, for again the presupposition of *also* (and presuppositions in general) can be satisfied without reference to identical linguistic material. And even if QR is necessary, this is irrelevant to the point here since the claim that *also* triggers QR would make this case exactly like that of ACD. Reanalysis is still required in the *the* condition; it just might be that the reanalysis at best takes place earlier than it does for the simple ACD case (perhaps it happens when the comprehension mechanism encounters *also*). But wherever it happens, no reanalysis is required in the *every* condition since QR would have already applied by the time the relevant QR trigger is encountered. Hence this case should behave exactly like the case of ACD under the QR hypothesis: *every* should have an advantage over *the*.

This prediction was also tested in Gibson et al. 2014, Experiment 3. There we crossed determiner (*every, the*) with the ellipsis type (plain ellipsis, ellipsis with *also*, and full verb). As in all the other experiments that we ran, we replicated the



**Figure 2** Z-score acceptability rating results from Gibson et al. 2014 Experiment 3, crossing determiner (*the/every*) with ellipsis (with and without *also*). Error bars show 95% confidence intervals.

interaction that HKV observed between determiner (*every, the*) and ellipsis / full-verb. Here, we focus the conditions with and without ellipsis, which were again edited versions of HKV's Experiment 1 stimuli:

- (10) The understaffed general hospital was negotiating with every/the doctor that the nonprofit medial organization was/also was.

As in the other experiments that we reported, the task was to rate sentences for their acceptability on a scale from 1 (Extremely unnatural) to 5 (Extremely natural). We present z-transformed acceptability ratings (means and standard deviations estimated within participants) from 60 participants and 60 items in Figure 2. As can be seen in the figure, the determiner and ellipsis factors interacted for the ellipsis conditions with and without *also*, such that there was a larger difference between the *every* and *the* conditions for the versions without *also* than for the versions with *also*. In particular, the *every* condition is rated as more acceptable than the *the* condition for the versions without *also*, but this

difference disappears for the versions with *also*, as predicted by the Sameness hypothesis but not the QR hypothesis. It is interesting to note that use of *also* seems to degrade the stimuli with *every*. We return to this in Sec. 5.

Additional evidence against the QR hypothesis is provided in Gibson et al. 2014. For example, the advantage for *every* over *the* disappears when the sentences are placed in a supporting context, and where this context allows for an independent connection to be established between the events. This is consistent with our account, whereas the QR hypothesis has no account as to why supporting context should make a difference.

## 5 The Causal hypothesis

The two experiments reported on above clearly favor the Sameness hypothesis over the QR hypothesis as an explanation for the HKV effect (the advantage of *every* over *the* when *also* is not present). But this explanation raises an important question: just why is it that there is pressure to insert *also* when the events are 'the same' in the *the* condition but not with *every*? Note that (6) above gives evidence for the claim that the pressure to use *also* disappears when some independent connection can be established between the events. And so, in Gibson et al. 2014 we speculated that the reason that there is less (or no) pressure to insert *also* with *every* is what we call the Causal hypothesis, repeated here: the reason that the pressure is less (or disappears) with *every* is because it is easier to establish a causal connection with use of *every* over *the*. This was just given as a speculation in Gibson et al. 2014; here we provide evidence in support of this hypothesis. First, we can make the claim more specific. Since most of the stimuli used in HKV and all of the stimuli that we constructed to test this hypothesis are such that the subject is agentive, the particular natural causal connection that is established between clauses concerns one character trying to emulate the other. We call this the "copycat reading" (with thanks to Geoff Pullum both for the terminology and for pointing out to us that this is the natural interpretation with *every*). Consider the discourse in (11):

- (11) a. Bill read every/the book that Mary read.  
b. Mary read *Crime and Punishment*.  
c. Bill read *Crime and Punishment* because Mary did.

The Causal hypothesis predicts that speakers will rate (c) as more likely to be true in the *every* condition than in the *the* condition.

To evaluate this prediction, we presented 40 participants on Mechanical Turk with sentences like those in (11a-b) followed by a question like that in (12a) (note that (12b) contains no elided material):

- (12) a. How likely is the following causal statement?  
 b. Bill read *Crime and Punishment* because Mary read *Crime and Punishment*.

Participants were asked to respond on a scale of 1 (extremely unlikely) through 7 (extremely likely). We constructed 20 items, in two conditions (*every*, *the*) (see the Appendix for a complete list), along with 20 fillers, 10 which were constructed to be likely causes, as in (13), and 10 which were constructed to be unlikely causes, as in (14). In each case, the (a) sentences were given to the subjects, followed by the question "How likely is the following causal statement", followed by the (b) sentence:

- (13) Example likely cause filler item:  
 a. The patient took the medicine. The doctor prescribed it.  
 b. The patient took the medicine because the doctor prescribed it.
- (14) Example unlikely cause filler item:  
 a. Joe disliked Adam, and tried to ignore him completely in the class they shared. Adam scored very highly on the test.  
 b. Joe scored very highly on the test because Adam scored very highly on the test.

We fit a mixed-effects linear model predicting the ratings, with the means and standard deviations estimated within participants. The analyses that we report here were conducted with the lme4 package (Bates, Maechler and Dai 2008) for the statistical language R (R Core Development Team 2008), including random slopes for all fixed effects grouped by participants and items in our model (Barr, Levy, Scheepers and Tily). Significance (p) values were estimated from the t-statistic. Because of the large number of data points in our experiments, reliable t-values are those that are larger than approximately 1.96.

The Causal hypothesis was supported: subjects rated the *every* condition as having a much higher likelihood of the causal relation holding (*every*: 5.31 vs. *the*: 4.45  $t = 5.27$ ). Thus, given that we know that *also* is not required in cases where there is a causal connection (see (6)) and given that we have shown that speakers are more likely to establish a causal connection with *every* than with *the*, it follows that the former will exhibit less pressure to insert *also*. And from that fact it follows that without use of *also*, the *the* sentences will be degraded in ACD over the *every* sentences. QR is not needed to explain this contrast.

Our account still contains an open question: why is it that insertion of *also* in the *every* condition degrades the stimuli? One hypothesis is that insertion of *also* actually suggests a coincidental nature of the sameness of the events. But if *every* also pushes one to posit a causal connection (the copycat connection), perhaps

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there is a tension between these, causing a degradation in acceptability. We attempted to evaluate this idea by asking 80 Mechanical Turk participants to rate the causal connection between 20 pairs of sentences, where the first sentence contained a relative clause with *every* and *also*, or just *every*, as in (15a):

- (15) a. Bill read every book that Mary read/also read.  
b. Mary read *Crime and Punishment*.

- (16) How likely is the following causal statement?  
*Bill read Crime and Punishment because Mary read Crime and Punishment.*

We also asked participants to rate the acceptability of the ACD sentences in (15a) on their own initially. We replicated the acceptability difference that Gibson et al. 2014 had observed for this contrast (*every*: 5.53 vs. *every + also*: 4.60  $t = 7.20$ ). In addition, there was a small but reliable difference in causality ratings between the two conditions in (15a), such that the versions with *also* were rated as less causal than the versions without *also* (*every*: 5.48 vs. *every + also*: 5.36  $t = 2.91$ ). This supports the view that the insertion of *also* suggests a coincidental nature of the two events, thus slightly reducing the possibility of a causal connection between the two clauses. It is, however, unclear whether this explanation accounts for the whole acceptability difference between the *every* conditions with and without *also*. This is a large effect, and the causality effect that we measured was small. It might also be that the explanation that we are giving accounts for most of the effect, but that the causality ratings don't entirely measure this effect. After all, acceptability ratings ask about the naturalness of the *language* that is used, whereas the causality ratings ask about the causality of the *events*.

## 6 HKV's Experiment 2 with large ellipsis: Predictions of the 2 accounts

### 6.1 Predictions of HKV account according to HKV

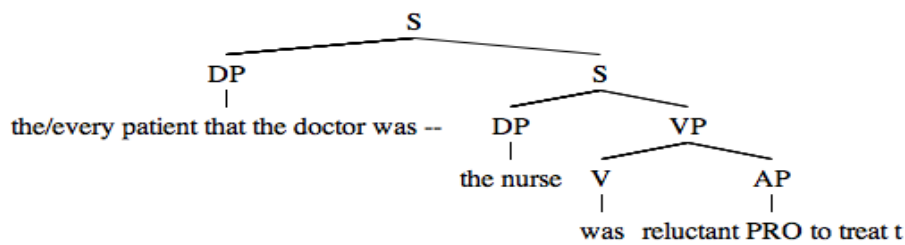
HKV conducted a second experiment with ellipsis in embedded contexts; the focus here will be on what their 'large ellipsis' conditions. Consider (17):

- (17) The nurse was reluctant to treat the/every patient that the doctor was.

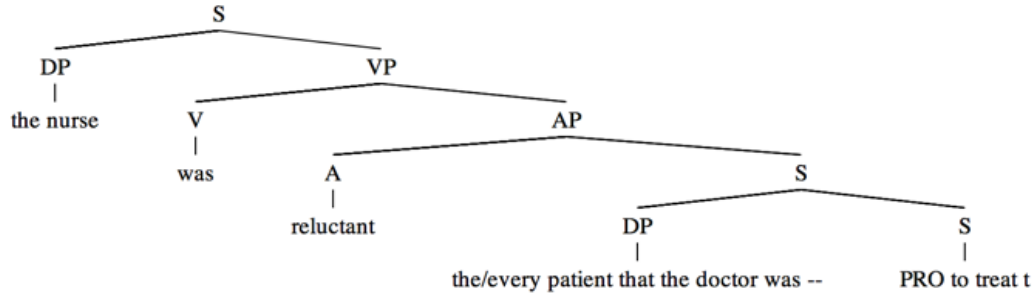
Here the ellipsis site can be understood as *reluctant to treat*. Note that this is possible under the TVP Ellipsis analysis because *reluctant to treat* can be composed up to give a complex TVP; see Cormack 1984 and Jacobson 1992a for discussion. However, as shown in Sag 1976 (see also Williams 1977), (17) has the relevant interpretation only if the object *the/every patient that the doctor*

*was (reluctant to treat)* is interpreted *de re*. With Sag, HKV assume that the *de re* reading is possible only if QR applies to the matrix clause as in (18a) but not (18b). (In fact, Cormack 1984 and Jacobson 1992a both show that the necessity for a *de re* interpretation is also accounted for under the TVP Ellipsis analysis, so the unavailability of the *de dicto* interpretation does not provide evidence for QR over the TVP account. We will, however, frame the discussion here under the QR account since we are discussing the reasoning in HKV.)

(18) a. High QR allows ellipsis to be resolved, and results in a *de re* reading:



b. Low QR - ellipsis cannot be resolved:



HKV make one further assumption about processing (in addition to the assumption that it will do the minimum necessary in order to arrive at a reading). This is that when it tries QR, it will apply it first 'minimally' - that is to the lowest site at which to which the QR'ed DP can be adjoined. This might be supported by the fact that a sentence like (19) has a preference for a *de dicto* reading (although both are possible), which is the reading that would result from low QR:

(19) Bill wants to visit the smallest state in the US.

(Of course the *de re* reading is also possible here and easy enough to get in the right context, so the parser must, of course, be able to reanalyze even after it arrives at a reading if that reading is not supported by the context.)

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In light of these assumptions, HKV claim that the QR hypothesis makes an interesting prediction for the case of 'Large ellipsis' as in (17). The prediction is that in examples like (17), *every* should have no advantage over *the*. Their reasoning is as follows. In the *every* condition, QR would have already applied by the time the ellipsis site is encountered. But crucially, it would have applied minimally, giving the representation in (18b). This still does not allow the ellipsis to be resolved; the 'antecedent containment' problem persists. Thus reanalysis is needed in either case and so *every* would have no advantage. HKV tested this prediction, and it was borne out. In fact, not only was there no advantage for the *every* condition, but there was a significant advantage for *the* condition – an observation which HKV do not account for. They do provide brief speculation in a footnote that perhaps QRing something that has already undergone QR (the *every* condition) is more costly than QRing material from its original position (the *the* condition). But they provide no principle from which this should follow and so nothing in their analysis accounts for the advantage of *the* over *every*.

## 6.2 A closer look at the HKV prediction

Do the HKV assumptions really predict that there should be no advantage for *every* over *the*? As far as we can tell they do not. As discussed above, reanalysis is needed with *every* just as it is with *the* because the minimal QR hypothesis means that the DP has attached in such a way that the ellipsis cannot be resolved. But what is unclear is why the comprehension mechanism would not need two instances of reanalysis *the*, resulting in a similar disadvantage as in the simpler ACD examples.

Let us turn in more detail to the case of *the*. Initially there would be no QR, because there is no reason to try QR until the language comprehension mechanism encounters the ellipsis site. It is important to stress again that the comprehension mechanism does not and cannot know that QR will resolve the ellipsis. It could know that only if it knew what meaning it was trying to compute but then it would already know the meaning. Presumably when the comprehension mechanism encounters ellipsis it simply tries to find some antecedent (i.e., some VP representation or meaning) to supply; it does what it can, and QR is one tool at its disposal. The key part of HKV's reasoning is given in the following passage: "When the non-local ACD site is hosted by a definite DP, however, the parser can determine *at the point where QR is triggered*, that is when the parser encounters the ACD site marked by *was*, also *how far the object DP has to be moved*. Thus only one instance of reanalysis is necessary." (HKV 2012: 182, fn. 45, italics ours). Thus their claim is that each condition (both *the* and *every*) requires exactly one instance of reanalysis, and so neither should have an advantage over the other.

We, however, don't see how the comprehension mechanism can – at the point that reanalysis is needed – "determine how far the object DP has to be moved". How could the comprehension mechanism make this determination? HKV provide no details. The comprehension mechanism would somehow have to be 'smart enough' to see that low QR will not be good enough to resolve the ellipsis. But it is difficult to imagine how that could be determined other than by constructing the low QR representation, and seeing that there still no plausible antecedent for the ellipsis site. Hence, under the (uncontroversial) assumption that the comprehension mechanism does not know what meaning it is trying to compute, combined with the assumption that it always performs minimal QR first, it should – in the *the* condition – first perform the minimal QR, giving (18b). But – just as in the case of *every* – this does not resolve the ellipsis, so it needs to perform a second reanalysis and a second QR. Hence in the *every* condition only one instance of reanalysis is necessary; in the *the* condition two instances of reanalysis are necessary, and so *every* should retain its advantage.

One might try one more tack here. Could it be that the comprehension mechanism in the *the* condition 'knows' to perform high QR because it sees that the missing complement is the complement of *was* and so it knows that it is looking for some AP constituent to supply here? Perhaps this is what HKV are assuming, but it remains unclear what would be the algorithm by which this knowledge would drive it to perform high QR. Again, knowing that there is an instance of the adjective *reluctant* in the matrix is not sufficient to know that performing an instance of QR under *reluctant* will still not resolve the ellipsis. Although a linguist might be able to see this, that is probably because s/he can compute what happens with low QR. Perhaps there is some principle available to the parser which dictates the same sort of knowledge. But until such a principle is spelled out (and given independent justification), there is no obvious reason to believe that the comprehension mechanism can 'know' just how far to move the object DP. Hence the claim that HKV's assumptions predict the lack of advantage for *every* over *the* is not well documented at this point.

### 6.3 Predictions of our analysis in the 'large ellipsis' condition

In contrast to the QR hypothesis, our analysis does predict that the advantage for *every* should disappear. This follows because in these embedded cases, the upper verbs and adjectives are generally non-agentive, and so the copycat reading with *every* is unavailable. To elucidate, recall first that large ellipsis requires a *de re* reading. So, take something like (20) whose *de re* reading is paraphrased in (21):

(20) The nurse was reluctant to treat the/every patient that the doctor was.

- (21) for the/every patient  $x$  that the doctor was reluctant to treat, the nurse was reluctant to treat  $x$

Note that under this interpretation, the nurse's mental state does not include reluctance to "be a copycat" (as it could for the *de dicto* interpretation of a non-ellipsis sentence such as *The nurse was reluctant to treat the/every patient that the doctor was reluctant to treat*). Second, note that the copycat reading is induced only by volitional predicates. The copycat reading in (11a) for example (*Bill read every book that Mary read*) involves supplying a scenario in which Bill tries to emulate Mary and is the agent of *read*. But we can assume that there is no deliberate 'copying' of mental states, i.e., that there is no control over mental states. Thus, person A cannot decide to have the same reluctances as person B. This means that the copycat reading is induced only by volitional predicates, and so we would expect the copycat-induced advantage for *every* over *the* to emerge only for cases of volitional predicates. Indeed in HKV's Experiment 1 (where *every* does have an advantage over *the*), of 60 stimuli, 47 were clearly volitional, 5 clearly not, and 8 unclear. In their Experiment 2 (Large Ellipsis) where *every* had no advantage, of 60 stimuli, 6 are arguably volitional, 6 unclear, and 48 clearly non-volitional. (Recall that it is the upper predicate that is at issue. Whereas the lower predicate could be volitional, that would be relevant only for *de dicto* readings in which the copycat property would be a part of the attitude holder's attitude). Incidentally, in our new experiments where we tested for the strength of causal interpretations, all 20 of our items were volitional. This was deliberate so as to make the ability of the copycat/causal reading available since our goal was simply to test the difference between *the* and *every*.

In sum, we claim first that speakers are more likely to posit a causal/copycat connection between the events in the case of *every* over *the*, and we demonstrate this above. When no such connection is posited, there is pressure to insert *also* (or something similar) in order to connect the two events, and hence the stimuli with *the* (and without *also*) are degraded over those with *every* (without *also*). This explains the basic HKV effect. However, the scenario that induces the causal/copycat connection is available only when the relevant predicates are volitional. In general, in their Experiment 1 the predicates are volitional (and our modifications of these with same verb and with *also* used slightly edited versions of their materials, so our followup studies also used predominately volitional predicates). But in their Experiment 2 with large ellipsis (where the upper predicate is relevant), the vast majority are *not* volitional. This means that in any case the copycat reading is unavailable for *every* and so it should be no better than the corresponding stimuli with *the*. This entire chain of reasoning could perhaps be tested by constructing Large Ellipsis cases with matrix volitional predicates, but it is difficult to construct relevant stimuli as the most natural cases necessarily

involve non-volitional attitude predicates, or ones for which the copycat reading is not salient for other reasons. (Note too that the copycat scenario is not the only logically possible causal connection that one might think of, but it is difficult to imagine other relevant causal connections without sufficient supporting context.)

And this brings us to a final speculation as to why *the* might actually have an advantage over *every* here. Since no copycat/causal connection is easy to establish in the Large Ellipsis condition, the listener naturally comes to the conclusion that the 'sameness' of the events is a coincidence when these stimuli are presented out of context. But it is much more plausible to have the 'coincidental' reading for *the* over *every*, as the former requires just one same event. Lest this seem like a complete *Just So Story*, informal discussion with two separate informants have revealed that they do in fact have this intuition about these sentences. That is, they find the relevant reading of (20) to be less plausible with *every* than with *the*. And it could well be that this translates into an acceptability judgment (speakers will rate something as less acceptable if it is less plausible or more difficult to establish a context in which it is plausible). Thus our account at least provides a tentative explanation for the advantage that HKV found for *the* over *every*. (Another possibility noted in Gibson et al. 2014 might be just that *de re* readings are easier to get with *the*.)

## 7 Conclusion

We have provided evidence that the HKV effect regarding the difference between *the* and *every* has nothing to do with QR but rather derives from an interaction of independent principles. There is pressure to insert *also* (or something similar) in cases where the events are 'the same' unless an independent connection can be established between them. Listeners do establish such a connection in the case of *every*; they are more likely to posit a causal relation between the events (in the form of a 'copycat scenario') than with *the*. Moreover, such a relation cannot be established in the 'Large ellipsis' condition which means that HKV's finding that the advantage of *every* over *the* disappears here is expected.

Thus this domain gives no evidence for QR. Of course we have provided no evidence here against QR or LF nor evidence for the alternative TVP Ellipsis analysis; these are argued for elsewhere. But we have shown that this particular argument for QR does not go through, and this domain does not threaten a theory with no LF.

## Appendix: Materials for experiment testing the causal hypothesis

The 20 experimental materials are given below. We show the first sentence just with *the*, but these were of course matched with the same sentence containing

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*every*. Participants were presented with a pair of sentences and were then asked: *How likely is the following causal statement?* The causal statements that followed are all on the model of (16) in the text.

1. John read the book that Mary read. Mary read *Crime and Punishment*.
2. Sally sampled the dish that Peter sampled. Peter sampled the hot curry.
3. Caroline visited the European country that Donna visited. Donna visited Austria.
4. Ted watched the movie that Eleanor watched. Eleanor watched *The Godfather*.
5. Valerie spent time at the exhibit that Samson spent time at. Samson spent time at the Rembrandt painting exhibit.
6. Mike went to the concert that George went to. George went to the U2 concert.
7. On New Year's Eve, Tom went to the party that Kelly went to. Kelly went to the party at the Hilton hotel downtown.
8. Sarah voted for the candidate that John voted for. John voted for the fringe mayoral candidate.
9. Emily test drove the car that Bill test drove. Bill test drove the new Honda.
10. Annabel openly admired the painting that Corey openly admired. Corey openly admired the painting by Monet.
11. Professor Jones praised the student that Professor Smith praised. Professor Smith praised Allan the young freshman.
12. Rita endorsed the bill that Arnie endorsed. Arnie endorsed the bill for tax reform.
13. Carol learned to play the instrument that Sue learned to play. Sue learned to play the flute.
14. Joe studied the language that Bill studied. Bill studied Chinese.
15. Cooper marched in the parade that Cora marched in. Cora marched in the Veterans Day parade.
16. Patricia demonstrated for the cause that Roland demonstrated for. Roland demonstrated for animal rights.
17. David wore the type of shirt that Bailey wore. Bailey wore a plaid shirt.
18. Donna walked on the path that Marie walked on. Marie walked on the path around the lake.
19. Sonya stayed at the hotel that Jim stayed at. Jim stayed at the downtown Hyatt.
20. Ernie ate at the restaurant that James ate at. James ate at the new Italian restaurant.

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